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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/825,400	03/28/97	MURATA	H 640679/6439

FOLEY & LARDNER
3900 K STREET NW SUITE 500
PO BOX 25696
WASHINGTON DC 20007-8696

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EXAMINER

SODERQIST, K

ART UNIT PAPER NUMBER

2109

DATE MAILED: 03/04/98

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action SummaryApplication No.
08/825,400Applicant(s)
Murata et al.Examiner
Kristina SoderquistGroup Art Unit
2109☒ Responsive to communication(s) filed on Election dated 2-4-98☐ This action is **FINAL**.☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire three (3) month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims☒ Claim(s) 1-11 is/are pending in the application.Of the above, claim(s) 5-11 is/are withdrawn from consideration.☐ Claim(s) _____ is/are allowed.☒ Claim(s) 1-4 is/are rejected.☐ Claim(s) _____ is/are objected to.☐ Claims _____ are subject to restriction or election requirement.**Application Papers**☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.☒ The drawing(s) filed on Mar 28, 1997 is/are objected to by the Examiner.☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.☐ The specification is objected to by the Examiner.☐ The oath or declaration is objected to by the Examiner.**Priority under 35 U.S.C. § 119**☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been☒ received.☐ received in Application No. (Series Code/Serial Number) _____.☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).**Attachment(s)**☒ Notice of References Cited, PTO-892☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 4☐ Interview Summary, PTO-413☒ Notice of Draftsperson's Patent Drawing Review, PTO-948☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Restriction Requirement

1. Applicant's election of Group I, claims 1-4 in Paper No. 7 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)), and, therefore, is made final.

Drawings

2. The drawings are objected to because they must be cross-hatched in accordance with MPEP 608.02. Correction is required.
3. Figures 15A and 15B should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

Claim Rejections - 35 USC § 112

4. Claims 1-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Examiner recommends inserting --per unit length-- following "coplanarity" in line 7 of claim 1 for clarity, as the phrase "per 1 mm" is in fact the units of the value of the coplanarity per unit length, as described/defined in the Specification.

In claim 3, line 2, use of the term "nearly" is vague and indefinite.

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Claims 2 and 4 are dependent upon a rejected base claim.

Interpretation of Claim Language

5. In claim 4, line 4, "the height of said solder bumps" has been interpreted to be the maximum distance from the bottom surface (or point) to the top flat surface.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Latta (U.S. 5,385,291) and Applicant's own admission. Latta discloses a substrate (reference number 18) having a joining surface; a plurality of solder bumps (reference number 14) disposed on the joining surface of the substrate in such a manner as to form a predetermined profiled line or surface pattern; and pads (reference number 16) interposed between the solder bumps and the substrate to serve as base layers of the solder bumps. The tops of the bumps are flat and leveled such that they are nearly circular flat surfaces, and the tops of the bumps are smaller in diameter than the pads. (See column 2, lines 42-52)

Latta discloses the claimed invention except for the limitation the coplanarity of the solder bumps is 0.5 μ m or less per 1 mm. However, it is well known in the art of circuit boards that a

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coplanarity as small as possible, thus as close to zero as possible, is desirable in order to guarantee reliable connections - as evidenced by Applicant on page 2, lines 10-20. As such, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the coplanarity per unit length of the solder bumps to be as close to zero as possible, including 0.5 μm or less per 1 mm, to ensure connections between all of the bumps and the pads (for example reference number 12 of Latta) they are being connected to. Additionally, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

With respect to claim 2, Latta is silent to the shape of the pads; however, various shaped, including circular, pads are known in the art of circuit board connections. It would have been obvious to one having ordinary skill in the art at the time the invention was made to choose any known shape, including circular, as the shape of the pad, as it has been held that a mere change in shape involves only routine skill in the art. *In re Dailey*, 149 USPQ (CCPA 1976)

8. Claims 1, 2, and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akasaki et al. (U.S. 5,217,922) and Applicant's own admission. Akasaki et al. discloses a substrate (reference number 2) having a joining surface; a plurality of solder bumps (reference number 4) disposed on the joining surface of the substrate in such a manner as to form a predetermined profiled line or surface pattern; and pads (reference number 11A) interposed between the solder bumps and the substrate to serve as base layers of the solder bumps. The tops of the bumps are flat and leveled such that they are nearly circular flat surfaces which are substantially equal in

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diameter to the pads, and the height of the solder bumps is smaller than the diameter of the pads.
(See Fig. 2F)

Akasaki et al. discloses the claimed invention except for the limitation the coplanarity of the solder bumps is $0.5\mu\text{m}$ or less per 1 mm. However, it is well known in the art of circuit boards that a coplanarity as small as possible, thus as close to zero as possible, is desirable in order to guarantee reliable connections - as evidenced by Applicant on page 2, lines 10-20. As such, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the coplanarity per unit length of the solder bumps to be as close to zero as possible, including $0.5\mu\text{m}$ or less per 1 mm, to ensure connections between all of the bumps and the pads (for example, pad directly opposite reference number 11A in Akasaki et al.) they are being connected to. Additionally, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Degani et al. (U.S. 5,546,617); Scharr et al. (U.S. 5,346,857); and Gutierrez et al. (U.S. 5,371,328) disclose two items connected together in which the coplanarity of the bumps is shown to be zero.

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With respect to claim 2, Akasaki et al. is silent to the shape of the pads; however, various shaped, including circular, pads are known in the art of circuit board connections. It would have been obvious to one having ordinary skill in the art at the time the invention was made to choose any known shape, including circular, as the shape of the pad, as it has been held that a mere change in shape involves only routine skill in the art. *In re Dailey*, 149 USPQ (CCPA 1976)

10.

Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kristina Soderquist whose telephone number is (703) 305-6318.

Examiner Soderquist's supervisor, Mrs. Kristine Kincaid, can be reached at (703) 308-0640.


BOT L. LEDYNH
PRIMARY EXAMINER
GROUP 2100

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February 26, 1998